

WITH THE AUTHOR'S COMPLIMENTS.

*New Labyrinthodont from the
Karoo Beds.*

BY

H. G. SEELEY, F.R.S., F.G.S.

[*Extracted from the GEOLOGICAL MAGAZINE, N.S., Decade V, Vol. IV,*
October, 1907.]

LONDON: DULAU & CO., 37, SOHO SQUARE, W.



Labyrinthodont Reptilian remains from the Upper Karroo Beds of Cape Colony.

EVIDENCES OF A MANDIBLE OF A NEW LABYRINTHODONT FROM
THE UPPER KARROO BEDS OF CAPE COLONY (*PTYCHOSPHENODON*
BROWNII).

By H. G. SEELEY, F.R.S., F.G.S., King's College, London.

(PLATE XIX.)

I AM indebted to Mr. Alfred Brown, of Aliwal North, for the opportunity of describing a small fragment of a lower jaw of a Labyrinthodont which shows some unusual characters in the dentition and in the composition of the mandible (Pl. XIX, Fig. 1). Hitherto the evidence of the structure of the mandible has been imperfectly recorded in these South African reptiles.

Mr. Brown's specimen is a small transverse segment, probably from the left ramus, at some little distance behind the symphysis. This position may be indicated by an angular ridge upon the inner side, which is becoming more elevated as it extends forward. There is no suggestion of the original length of the mandible, which may have been eighteen inches. The fragment is little more than an inch and a half long. In section the jaw is subquadrate, somewhat depressed, being two inches wide and an inch and a half deep. The external surface of the bones shows no trace of sculpture. From its slightly water-worn condition the specimen (Fig. 1) was probably obtained from the reconstructed bed at the railway station at Aliwal North, which yields Theriodonts and other fossils.

The external bone is apparently vertical, traversed on the lower third by a deep longitudinal groove, in which there is a faintly marked suture. The dentary bone above the groove is slightly convex up to the alveolar margin, and shows what may be a sinuous impression above the groove. The bone below the groove, which may be infra-dentary, is well rounded on to the base.

The base is flattened, but slightly convex from side to side, and is marked by a median groove which traverses a median inferior bone defined laterally by two irregular sutures. The base of the jaw is limited towards the inner side by a slight angular ridge. The inner side is divided into upper and lower flattened areas by the median angle already referred to. There is a longitudinal suture in the middle of the upper portion of the palatal surface.

The transverse sections, back and front, are vertical and clean, practically unworn, and of similar transversely oblong form.

In the middle is an oblong central cavity (M.), which is less than an inch wide and less than half an inch deep. From it the sutures radiate which separate the constituent bones. When the specimen is examined from the external surface the only well-marked sutures are upon the base, so that on such evidence the jaw might be interpreted as formed of two bones. The narrow straight lateral line between the surangular and splenial on the inner side might pass for a crack in the specimen. Similarly, the line in the external groove between the elements of the dentary and infra-dentary might have been supposed to be the opposite side of the same fracture but for the transverse sections. These lateral conditions are found to be natural divisions when the broken ends of the fragment are examined. More or less serrated and angulated sutures are marked by lines of black matrix as represented in the figure (see Pl. XIX, Fig. 1). They are not all followed with equal facility, and the external dentary bone is obscurely divided into superior and inferior elements by suture, for the division is less evident at the other fractured end. The complicated suture between the internal splint bone, which I regard as the splenial, and the two bones on which it rests is also less distinct on the posterior fracture in this specimen, where the surface is more weathered, but may be followed with a magnifying-glass. The most interesting suture is the vertical division, showing that two distinct parallel bones support the teeth in two parallel rows, of which the outer row is rather the longer.

The external dentary bone carries five teeth, which are close set. Their crowns are broken and show no trace of a pulp cavity. The basal attachment is four times as wide as long from front to back. The attachment of the teeth is of a pleurodont type, for the external alveolar border rises fully half an inch above the rounded internal exposures of the crowns; and on their inner side the dentary bone rises as an oblique rounded strip from the groove in which these teeth are imbedded. Both front and back fractures pass through the bases of crowns of teeth. In the middle of the base of the tooth, on what may be the posterior fracture, the crown descends in a small short oblong portion into a shallow socket, and shows the same folded structure as the rest of the tooth. The smooth surfaces of the teeth are marked with fine parallel vertical grooves upon the enamel, which vary in depth on the several teeth. Each crown decreases in size as it ascends, by becoming narrower from within outward.

The bone which abuts against the dentary above the Meckelian vacuity on the inner side of the jaw is regarded as the surangular bone, and beneath it is the angular bone. The lateral junction between these bones is hidden by the splint-like covering of the splenial. The determination of these elements rests upon the sutures shown in the transverse sections. But if there is an infra-dentary, there may also be an infra-angular; and these elements may be upper and lower divisions of the angular bone.

The upper or surangular bone is small compared with the dentary, to which it is parallel and internal. At its suture with the dentary

bone it rises above the level of the dentary on the superior dentigerous surface, where it is roughened and vascular, forming a supporting outer ledge for the teeth which it carries, which is of the same kind as the external elevated alveolar border of the dentary bone. The teeth, however, are smaller; they are not so close set in this specimen; each has a transversely ovate base, and is implanted in a shallow conical pit or socket, which the base of the tooth does not completely fill, for a groove extends round the base of the inner side of the tooth. The base is invested with an osseous cement, above which the crown shows vertical grooves of the same type as are seen upon the row of teeth in the dentary bone. At one end of the specimen a fracture passes through the base of a tooth, and shows the same folded structure in these teeth as in the parallel dentary tooth; next is a large empty socket, the base of which is not clean from matrix; this is followed by a broken tooth in position; and lastly, after an interval, the terminal fracture passes through the middle of a clean empty conical socket. The teeth of this inner row appear to diminish in size as they extend backward.

As the teeth are broken to the level of the alveolar margin of the dentary I availed myself of the opportunity to obtain a transverse section of a portion of a tooth on the dentary bone at the level of the alveolar border where the tooth is ovate. In microscopic enlargement the labyrinthic structure is much less folded and simpler than in any other tooth from these rocks which I have examined (Pl. XIX, Fig. 2).

In the Museum of the University of Munich a second specimen of the mandible of the same species is preserved, collected at Middelburg in Cape Colony. The late Professor K. v. Zittel placed it in my hands to complete this description. The Munich fossil is a fragment from the right ramus of the mandible, two and three-quarter inches long. It exactly corresponds in its position in the jaw with the fragment of the left ramus from Aliwal North. The anterior fracture is oblique, the posterior fracture is vertical. The sutures are not shown upon the black bone of these ends. The fossil indicates a long narrow skull, with a short mandibular symphysis (Pl. XIX, Figs. 3, 4).

The Middelburg specimen is from a soft matrix, which has been sufficiently removed to show the forms of the teeth and their implantation. The dentary series of teeth gives evidence of nine teeth in a length of two and seven-tenths inches, so that each tooth occupies three-tenths of an inch, as in the other specimen, and the basal attachment is eight to nine-tenths of an inch wide. Five teeth are lost, and as these are consecutive the bases are seen to be divided from each other transversely by ridges, forming shallow sockets (Fig. 4), rather more pronounced than those sometimes seen in the not dissimilar but deeper groove which carries the teeth in *Ichthyosaurus*.

The crowns are better preserved, and have a singularly compressed, sharp, triangular, wedge-shaped aspect, as though used for catching fish. They are flattened laterally, rounded on the narrow outer and inner aspects, which are straight and converge upward to a sharp point. Each of these wedge-shaped teeth was about one inch and a quarter long, but only one shows the extremity of the crown. Seen from the end, the contour of a tooth is not unlike a large longitudinally

grooved vomerine tooth of *Labyrinthodon*; it curves slightly inward (Pl. XIX, Fig. 2). On the inner side of the teeth the dentary bone rises in the same smooth rounded surface as in the other fossil, but externally an osseous cement appears to extend on to the tooth from the alveolar border.

The second inner row of teeth originates just behind the anterior fracture, and includes indications of about twelve close-set teeth, carried in a groove which gradually widens as it extends backward. The teeth are smaller than the dentary series, but the crowns resemble them in all ways, being similarly compressed from front to back and wedge-shaped. The early crowns are broken, and several are missing from their sockets. These teeth are implanted in the bone which extends down the jaw between the dentary bone and the splenial, which is probably the surangular bone. Below the suture the splenial bone is rounded and shows no trace of the angular condition of the other specimen. The base of the jaw is less flattened, traversed by three rather stronger little ridges; but the two sutures which are so marked a feature of the specimen from Aliwal North are not visible. The external lateral groove on the dentary bone becomes a circular tubular canal as it extends backward, running below the teeth. This groove is characteristic of Ichthyosaurs. A fine suture appears to run down its length, as in the fragment from Aliwal North separating the lower half of the bone as infra-dentary. The presence of such an ossification is an interesting approximation to the condition in Holoptychian fishes, in which Dr. Traquair's specimens show two parallel rows of teeth; and those fishes have their tooth substance folded in a way that approximates to Labyrinthodonts, and especially to this fossil.

The presence of these five bones in the mandible, which does not include the articular bone or the coronoid in the specimens preserved, appears to show that some South African Labyrinthodonts include seven bones in each ramus of the mandible. This character may not vary the general reptilian affinities of the skull, but appears to be a departure from the reptilian type in the mandible, which may approximate towards a lower type. The additional bone in the mandible is quite distinct from that described by Dr. Branson.

EXPLANATION OF PLATE XIX.

- Fig. 1.—Transverse anterior fracture of ramus of mandible in Aliwal North specimen, showing bones about the Meekel cartilage cavity (M.); dentary and infra-dentary externally, surangular and angular internally, overlapped by the splenial bone on the inner side. *a*, anterior end.
- „ 2.—Transverse section, much enlarged, of part of a dentary tooth of the same specimen. The section was prepared by Professor Chapman, of Melbourne, and photographed by A. Campion, Esq., in the metallurgical laboratory, Coopers Hill.
- „ 3.—End view of the Middelburg specimen in the Munich University Museum, showing an entire external tooth, with natural curvature of the crown.
- „ 4.—The same specimen seen from above, showing a succession of empty tooth sockets on the mandible.

Figs. 1, 3, and 4 are of the natural size.